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EXAMINER	
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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/071,664
Filing Date: February 08, 2002
Appellant(s): NEMOTO ET AL.

Burr & Brown
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 06/21/04.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that claims 1, 11-13, 15 and 17 do stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

6,071,645	Biensan et al.	06-2000
6,040,089	Manev et al.	03-2000

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 11-13, 15 and 17-18 are rejected under 35 U.S.C. 103. This rejection is set forth in a prior Office Action, mailed on 03/18/04.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1, 11-13, 15 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manev et al 6040089 in view of Biensan et al 6071645.

The instant claims are directed to a lithium secondary battery wherein the claimed inventive concept comprises the specific lithium transition metal compound. Other limitations include the additional elements; the average ionic radius; and the firing and synthesizing steps.

Regarding claim 1 and 11:

Manev et al disclose a positive electrode material for lithium/lithium ion secondary cells wherein the positive electrode material comprises a lithium multi metal oxide having a specific structure as follows (ABSTRACT):

[57] **ABSTRACT**

The present invention provides a positive electrode material for lithium and lithium-ion secondary cells which exhibits good cycleability, reversible specific capacity, and structural stability. The positive electrode material comprises a lithium multi metal oxide having a spinel structure and described by the general formula:

$$Li_{1+X}Mn_{2-Y}M_{m_1}^{1}M_{m_2}^{2}\ldots M_{m_k}^{k}O_{4+Z}$$

wherein M^1, M^2, . . . M^k are at least two cations different than lithium or manganese, selected from the group consisting of alkaline earth metals, transition metals, B, Al, Si, Ga and Ge;

X, Y, m_1,m_2, . . . m_k are numbers between 0 and 0.2;

m_1, m_2 and Y are greater than 0;

Z is a number between −0.1 and 0.2; and

wherein the metals M^1, M^2, . . . M^k and the corresponding values m_1, m_2, . . . m_k satisfy the following equation and inequality:

$$Y = X + m_1 + m_2 + \cdots + m_k$$

in particular, Manev et al disclose the use of nickel/titanium as a codopant combination (COL 4, line 46). Thus, Manev et al immediately envisage to substitute the combination of Ni/Ti in the lithium multi-metal oxide formula as part of a specific embodiment; wherein Y is a number between 0 and 0.2 ($0 < Y < 0.2$) (COL 3, line 50-51). It is noted that Y represents z as currently

claimed. In addition, specific **EXAMPLES 1-2** shows the molar amount z = 0.07 or z = 0.05, and M_1 and M_2 comprising equal amounts of respective elements ($M_1 = M_2 = 0.5$). Thus, Manev et al clearly envisage using equivalent molar amounts of the codoping (substitution) elements, and their teaching is fully applicable to the other various combinations including nickel/titanium.

Manev et al also disclose that the lithium metal oxide can include various codopant combinations, for example, combinations of nickel, titanium and magnesium, among other elements (COL 4, lines 39-45):

> Although the codopant combination of cobalt and titanium is described as a preferred embodiment for use in the invention, various other combinations can be used in accordance with the invention. For example, combinations of aluminum, cobalt, chromium, copper, iron, gallium, magnesium, nickel, germanium, molybdenum, niobium, titanium, vanadium and tungsten such as aluminum/

and in particular, nickel/titanium (COL 4, line 46):

> nickel/titanium. (COL 4, line 46).

Manev et al disclose that although the codopant combination of Co and Ti is described as preferred embodiment for use, combinations including nickel/titanium can be used (COL 4, lines 39-46). In that, Manev et al also disclose that in a particularly preferred embodiment the lithium metal oxide spinel compound is codoped with Co^{3+} and Ti^{4+} to form the spinel material; and preferably, in order for the dopants to achieve an specific valency, the molar amounts of Co^{3+} and Ti^{4+} are equivalent (COL 4, lines 27-37). In addition, specific **EXAMPLES 1-2** shows the molar amount z = 0.07 or z = 0.05, and M_1 and M_2 comprising equal amounts of respective elements ($M_1 = M_2 = 0.5$). Thus, Manev et al clearly envisage using equivalent molar amounts

of the codoping (substitution) elements, and their teaching is fully applicable to the other various combinations including nickel/titanium. Therefore, Manev et al do satisfy the claimed molar range requirement as specific examples in the prior art which are within the claimed range anticipate the range as well as prior art which teaches a range within, overlapping or touching the claimed range anticipates the range provided that prior art range discloses the claimed range with sufficient specificity. **(See MPEP 2131.03 Anticipation of Ranges)**.

Regarding claim 12:

It is disclosed that M is cation selected from the group consisting of alkaline earth metals (COL 3, lines 45-48), particularly, Manev et al teach that a codopant element can be magnesium (COL 4, line 39-44); wherein magnesium can be used to produce multiple doped lithium manganese oxide spinels which meet the disclosed formula (COL 4, lines 60-62).

Regarding claim 13:

Manev et al disclose that, in addition, a portion of manganese can also be replaced by excess lithium (COL 4, lines 31-35).

Regarding claim 15:

It is taught that the codopants typically have a mean ionic radii size (R_i) which corresponds to the mean ionic radii size of the manganese ions being replaced (COL 4, line 65 to COL 5, line 2).

Regarding claims 17-18:

As to the method limitations, i.e. the firing and the synthesizing steps, it is noted that a method limitation incorporated into a product claim does not patentable distinguish the product because what is given patentably consideration is the product itself and not the manner in which

the product was made. Therefore, the patentability of a product is independent of how it was made. However, Manev et al disclose the following (COL 6, lines 45-63):

> The mixture once prepared can be reacted by a solid state reaction to form the multiple-doped lithium manganese oxide spinel compounds of the invention. Preferably, the mixture is reacted by firing the mixture at an elevated temperature between about 400° C. and about 900° C. in the presence of oxygen, e.g., in an atmosphere with a partial pressure of oxygen of at least 20 kPa. The mixture can be fired in one step but is preferably fired in more than one step to produce the spinel compound. Preferably, the mixture is fired at a temperature between about 400° C. and about 500° C. for 1 to 24 hours, at a temperature between about 500° C. and about 600° C. for 1 to 24 hours, and at a temperature of between about 700° C. and about 900° C. for 1 to 24 hours. Additional firing steps can also be used in the invention to improve the quality of the resulting spinel as described, e.g., in U.S. Pat. No. 5,718,877, which is hereby incorporated in its entirety by reference. Once the mixture has been fired to form the multiple-doped lithium manganese oxide spinel compound, this compound is preferably cooled to ambient

Manev et al teach a lithium secondary battery according to the foregoing aspects. However, Manev et al do not expressly disclose the specific carbon negative active material.

Biensan et al reveals a lithium rechargeable electrochemical cell (TITLE & ABSTRACT) comprising one negative electrode wherein the electrochemically active material is selected from carbons among others (COL 2, line 65 to COL 3, lines 5).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the specific carbon negative active material of Biensan et al in the lithium secondary battery of Manev et al because Biensan et al teach that a negative electrode comprising an electrochemically active material such as carbon is suitable for use in lithium rechargeable cells because carbon material can reversibly intercalate lithium ions into its structure. Hence, carbon material is a suitable electrochemical active material for lithium rechargeable/secondary batteries. Furthermore, Manev et al and Biensan et al share applicant's

field of endeavor and are pertinent to each other as they both address the same problem of providing a suitable electrochemically active material for lithium electrochemical cells.

(11) Response to Argument

Appellants' arguments have been fully considered but they are not persuasive in overcoming the ground of rejection presented above.

The main contention of appellants' arguments is premised on the assertion that the prior art of record discloses "*an extremely broad disclosure in col 4, lines 39-62 (Manev et al'089), which encompasses 16,369 possible combinations, including 91 possible two-component combinations and 364 possible three-component combinations, and list thirty-four combinations (among them being "nickel/titanium") nowhere does Manev'089 provide disclosure regarding any other co-dopants, or examples which employed other co-dopants (let alone use of nickel and titanium as co-dopants). Manev'089 contains no disclosure regarding any expectation of favorable properties of the listed combinations, relative to any of the other encompassed combinations*" (See the Appeal Brief of 06/21/04, page 8, line 16 to page 9, line 4). Thus, it is the position of appellants that since the claimed combination of "nickel/titanium" is not one of the preferred embodiments (emphasis added) of the prior art and such combination of nickel/titanium is listed only as a possible combination, therefore, one of ordinary skill in art would not have been led to the selection of nickel/titanium as a co-dopant combination from within the extensive list of combinations. However, the examiner respectfully disagrees with because of the following reasons. First of all, the prior art (Manev'089) does clearly teach various other combinations encompassing nickel/tatinium (Manev'089, COL 4 lines 39-42 and line 46); including examples in which a co-dopant combination of equal amounts of two elements was employed as instantly

claimed, that is, M_1 and M_2 comprising equal amounts of respective elements ($M_1 = M_2 = 0.5$) (Manev et al'089 COL 7, lines 18-60). In addition, appellants have admitted such teachings (See the Amendment of 12/24/03 at page 6 and the Appeal Brief of 06/21/04, page 8, line 14 to page 9, line 4). Having said that, the question to answer now is whether one of ordinary skill in the art would have (at once) envisaged the use of the claimed combination of nickel/titanium based on Manev et al disclosure. By way of review and in order to provide an analysis as to why the prior art immediately envisages using the nickel/titanium combination, the examiner will use appellants' rationale indicating that Manev et al'089 disclosure encompasses 16,369 possible combinations to demonstrate that Manev et al'089 at once envisage so. Accordingly, among the 16,369 possible combinations of all metals listed, Manev et al'089 select with sufficient specificity the combination of nickel/titanium among others because if there is a total of 16,369 possible combinations (*as admitted and argued by the applicants*) as part of the extremely broad disclosure of Manev et al'089, and Manev et al'089 is specifically listing no more than 40 preferred combinations including at least nickel/titanium it can be concluded that Manev et al'089 do specifically name such combination (i.e. nickel/titanium), so as to be sufficiently limited or well delineated, and therefore immediately envisages the use thereof. Furthermore, out of the 91 possible two-component combinations (*as admitted and argued by the applicants*) Manev et al'089 is specifically disclosing about 25 preferred combinations including nickel/titanium. Thus, Manev et al'089 again immediately envisage the use of nickel/titanium as one of the two-component combinations. Stated somewhat differently, a generic chemical formula will anticipate a claimed species covered by the formula when the species can be at once envisaged from the formula as in this instance (**SEE MPEP 2131.03**).

Moreover, even if the generic formula encompassed too many compounds or a vast numbers, perhaps even an infinite number to constitute an anticipatory reference, after considering the specific compounds it has been found that a much more limited class of compounds was described, that is, one skilled in the art, on reading the reference, at once envisage each member of this limited class, even though this skilled person might not at once define in his mind the formal boundaries of the class, it is not the mere number of compounds in this limited class which is significant here but, rather, the total circumstances involved to describe to those with ordinary skill each of the various permutations ***In Re Petering 33 USPQ 275*** (emphasis added).

Furthermore, claims to a specific compound were held to be anticipated because the prior art taught a generic formula embracing a limited number of compounds closely related to each other in structure and the properties possessed by the compound class of the prior art was that disclosed for the claimed compound ***In re Schaumann 197 USPQ 5***. Also, even if the reference lists those 16,369 possible combinations as argued by the applicants, each and every one of the possible combinations is positively described ***Ex Parte A, 17 USPQ2d 1716***.

In addition, the examiner further addresses applicants' arguments regarding the declaration under 37 CFR 1.132 filed 12/24/03 and which reports the achievement of unexpected results. Firstly, appellants' allegation of unexpected results is unsuitable just because appellants are not comparing the combined closest prior art to the claimed invention as required by ***MPEP 716.02(d) - § 716.02(e)*** establishing that evidence of unexpected properties may be in the form of a direct or indirect comparison of the claimed invention with the closest prior art which is commensurate in scope with the claims. ***See In re Boesch 205 USPQ 215.*** Appellants have

failed to provide objective evidence demonstrating that the synergistic effect of having combined the negative active material including carbon and the positive active material including the specific $Li(Ni_{x1}Ti_{x2})_zMn_{2-z}O_4$ produces the unexpectedly superior results. To be precise, appellants simply focus on the specific molar amount of the positive active material without demonstrating criticality of the inclusion of the carbon negative active material which is basis for rejecting the present claims under the 35 USC 103 statute by using a secondary reference to remedy the deficiency of the lack of such negative material in the Manev et al'089 reference. Succinctly stated, appellants' unexpected results are solely based on the specific positive active material comparison between the claimed invention and the prior art, and not because of the addition of the carbon negative electrode material which is the subject matter/limitation forcing the 35 USC 103 analysis.

In all, appellants' allegation of unexpected results based on the positive active material including the specific $Li(Ni_{x1}Ti_{x2})_zMn_{2-z}O_4$ of which the specific compound and its molar range are immediately envisaged (emphasis added) by the prior art is equivalent to attempting to overcome a 35 USC 102 anticipation analysis by means of an affidavit/declaration under 37 CFR 1.132 knowing that evidence of secondary considerations, such as unexpected results, is irrelevant to 35 U.S.C. 102 rejections and thus cannot overcome a rejection so based ***In re Wiggins, 179 USPQ 421, 425 (See MPEP 2131.04 Secondary Considerations)***.

Specifically, what is under the 35 USC 103 scrutiny is not the specific compound $Li(Ni_{x1}Ti_{x2})_zMn_{2-z}O_4$ and its molar range which have been fully encompassed and at once envisaged by the single reference Manev et al'089; what is under the 35 USC 103 scrutiny is the inclusion of the negative active material including carbon, and therefore, to establish unexpected

results appellants must compare the criticality or unexpected results of using the carbon negative active material per se (emphasis added).

In addition, even assuming arguendo that appellant's allegation of unexpected results are appropriate, it is also noted that the foregoing performance characteristic of the exemplified battery cell does not reflect or correspond to the performance characteristic of the claimed lithium secondary battery because the objective evidence of nonobviousness is not commensurate in scope with the instant claims which the evidence is offered to support. For instance, it is noted that the data of Table 1 showing improved internal resistance ratio of coin cells does not evidence unexpected results for the entire claimed range of $X_1 > 0$, $X_2 > 0$ wherein X1 + X2 = 1 because as apparent from the results shown in Table 1 on page 22 of the specification and in page 3 of the declaration filed 12/24/03, significant internal resistance ratio of coin cell is expected when $X_1 = .005$ or 0.05, $X_2 = .005$ or 0.05 and not within the entire range of $0 < X_1 \leq 1.0$ and $0 < X_2 \leq 1.0$ as presently claimed. For that reason, it is contended that the objective evidence of nonobviousness is not commensurate in scope with the present claims.

Furthermore, the examiner also likes to contend that such results and, thus, the specific battery cell as prepared in EXAMPLES A, B, C, D and Ref. A (Embodiment 6) and Ref. B (Embodiment 7) are not commensurate with the specific lithium secondary battery as instantly claimed. In this respect, it is emphasized that the claimed lithium secondary battery lacks significant, essential, vital and/or crucial features, for instance: a) the specific positive active material composition including the specific compound molar ratio, conducting agent (i.e. the acetylene black powder), bonding material (i.e. polyvinylidene fluoride) and their weight contents; b) the specific positive active material imparted structure (i.e. the pressed material); c)

the specific electrolyte (i.e. the particular dissolved lithium salt $LiPF_6$ and organic solvents ethylene carbonate and diethyl carbonate used therefor) and their volume ratios as presented in EXAMPLES A, B, C, D and Ref. A (Embodiment 6) and Ref. B (Embodiment 7). Thus, the foregoing performance characteristics of the exemplified battery cell does not reflect or correspond to the performance characteristic of the claimed lithium secondary battery. This raises the issue of whether or not the synergistic effect of each and every battery cell component positively/negatively affects the internal resistance ratio of the coin cell, too.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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November 24, 2004

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